Pericardial effusion

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Etiologies / causes

Pericardial effusion is the third most common cardiac disease in dogs and accounts for around 10% of all cardiovascular diseases. Neoplasia and idiopathic pericardial effusion (IPE) are the most important causes whereas congestive heart failure, atrial splitting, trauma, bacterial or fungal pericarditis, uremia, peritoneopericardial hernias, intrapericardial cysts, and hypoalbuminemia are rare causes. The most common neoplasia is hemangiosarcoma mostly originating form the right auricle, followed by heart base tumors. Less common tumors are ectopic thyroid carcinoma, malignant lymphoma and mesothelioma. The diagnosis of neoplasia relies on the echocardiographic finding of a mass, however, diffuse tumors like lymphoma and mesothelioma may not be differentiated from IPE. The diagnosis of IPE is a diagnosis of exclusion, and is suspected when serosanguineous to bloody fluid accumulates in the pericardium and routine diagnostic methods fail to demonstrate an underlying cause, i.e. absence of detectable masses within the pericardium upon echocardiography, no evidence for suppurative inflammation or neoplasia upon cytologic examination of pericardial fluid, absence of any relevant cardiac disease, and absence of any pulmonary or abdominal (spleen, liver) neoplasia that may have resulted in a cardiac metastasis. [In cats, pericardial effusion is rare, the most relevant causes being congestive heart failure, neoplasia and feline infectious peritonitis.]

The clinical course of the disease varies depending on the underlying cause, and even within the same etiologic category. Dogs with hemangiosarcoma as a rule have a very poor prognosis. On the other hand, dogs with heart base tumors may not develop effusion or no clinical signs of tamponade for months to years. In cases of IPE, there is a wide variation in the course, some dogs may be cured after removal of all pericardial effusion by one single pericardiocentesis, whereas in others effusion may repeatedly recur. This variation may be due to different etiologies or different host responses to an eliciting cause or both. At the present time, the etiology of IPE in dogs is not known; immune mechanisms are thought to play a role, and viruses have been detected in a few dogs. In people, an etiologic association with different viruses and immune-mediated mechanisms is essentially established. Finally what appears to be IPE in some cases may actually be an undetected neoplasia, particularly mesothelioma, that may take a very slowly progressive course.

Occasionally, dogs with pericardial disease may have none or only mild pericardial effusion, i.e. they have constrictive or constrictive-effusive pericarditis. In constrictive-effusive pericarditis, the

important clue is that dogs with only mild pericardial effusion may have signs of severe right sided congestive heart failure; pericardiocentesis may present a high risk and is not expected to lead to marked improvement. In dogs with no pericardial effusion, i.e. purely constrictive disease, the diagnosis is difficult and may only be found with a high index of suspicion for the disease. [In cats, a relevant number of cases with idiopathic chylothorax may actually be caused by constrictive pericardial disease.]

Diagnostic approach

The diagnosis of pericardial effusion is based on clinical findings, supported by radiological and electrocardiographic findings, and verified by echocardiography.

Typical anamnestic findings are caused by cardiac forward failure manifested by exercise intolerance, weakness and sometimes syncope, and by right sided backward failure manifested by ascites. Furthermore, many owners recognize polydipsia in the days before signs of heart failure are obvious. This is later in the course of the disease a particularly useful finding for the owner to early detect a relapse. Additional findings on physical examination include tachycardia, weak pulses, muffled heart sounds, congested jugular veins, and possibly hepato-jugular reflux. The ascites is typically a modified transsudate characterized by a low cell count and a protein content >25 g/l. When all these abnormalities are present, a diagnosis can be strongly suspected, and additional diagnostics are mainly for refinement of the diagnosis. In cases of peracute effusion and tamponade, mainly seen with acutely bleeding hemangiosarcoma, only clinical signs of forward failure, i.e. cardiogenic shock, without evidence of ascites may be present. Congested jugular veins, as mentioned above, are a very useful finding to corroborate the suspicion of right sided congestion, however, in most animals the neck has to be shaved in order to actually see the congested veins, i.e. a high index of suspicion is condicio sine qua non to detect this clinical abnormality. An atypical presentation in acute tamponade may be “acute abdomen”, possibly due to acute pericardial stretch causing visceral pain.

Typical radiological findings are generalized cardiomegaly, no evidence of congested pulmonary veins and a prominent caudal vena cava. In cases of acute intrapericardial bleeding, however, the cardiac silhouette may not be remarkably enlarged. On the other hand, cardiac diseases with severe right sided volume overload may mimick pericardial effusion on thoracic radiographs.

Typical electrocardiographic findings include sinus tachycardia, low voltage, and electrical alternans. Nevertheless, as many cases just show sinus tachycardia, we do not usually write a diagnostic ECG. In contrast, during pericardiocentesis an ECG is our most important monitor.

The value of echocardiography, besides being the most definitive test, is for the search an an underlying cause, i.e. to identify a right auricular hemangiosarcoma or a heart base tumor. As mentioned above, mesothelioma can not be differentiated echocardiographically from pericarditis. Furthermore, particularly in cats pericardial fat may imply pathological pericardial thickening without correlate upon histopathology. Echocardiography further is helpful for guiding the needle during therapeutic pericardiocentesis.

If no mass can be identified echocardiographically, pericardial fluid analysis can give additional information about the underlying disease process. Rare cases of lymphoma or suppurative bacterial inflammation can be diagnosed cytologically. Also mesothelioma may be diagnosed cytologically, however, false-negative and false-positive results are possible, and thus results should be interpreted with caution. Pericardial fluid pH-analysis has been described to be sensitive and specific to differentiate between neoplasia and idiopathic pericarditits, however, this could not be confirmed in other studies, and is not useful in our hands.

Finally, in selected cases, histological examination of pericardial tissue is very useful for definitive diagnosis and choice of the best possible treatment. This is particularly true for cases with recurrent effusion, where no underlying cause can be identified by other means. Tissue may be obtained by routine thoracotomy, “mini”-thoracotomy or thoracoscopy.

Last but not least, in the future newer diagnostic modalities, particularly cardiac magnetic resonance imaging, are expected to be more broadly applied to better detect and differentiate neoplastic causes.

Treatment

Initial palliative treatment for any neoplastic or idiopathic case consists in pericardiocentesis. Although ultrasound guidance is helpful, it is not a necessary pre-requisite. ECG-monitoring, however, is strongly adviced in order to detect iatrogenic arrhythmias. Dogs are positioned in left lateral recumbency, the right side of the chest around the 4^{th}–5^{th} intercostal space at the costo-chondral junction is shaved and surgically prepared. The needle is introduced, where the heart beat can be best felt. Using an extension set and a 3-way stop clock, all effusion is removed. In dogs in critical condition, pericardiocentesis is performed without sedation, but local anesthesia. In stable and nervous smaller dogs, in order to decrease the risk of a iatrogenic myocardial injury, we use mild sedation using buprenorphine-acepromacine i.m. to avoid sudden movement of the dog during puncture.

The extent of further treatment depends on the underlying cause and the course of the disease. Possibilities for recurrent effusions are repeated simple pericardiocentesis, and partial pericardectomy by either mini-thoracotomy, full exploratory thoracotomy or thoracoscopy. In cases of neoplasia, besides palliative pericardectomy, adjuvant chemotherapy may be used. Finally, open heart surgery has been performed in cases of right atrial/auricural hemangiosarcomas, but in most cases, survival times were very short.

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